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ABSTRACT

Noting that the merging of various types of media with the computer has presented the field of education with a hybrid technology called interactive multimedia (also referred to as hypermedia), this digest begins by defining this technology as "the integration of text, audio, graphics, still image, and moving pictures into a single, computer-controlled, multimedia product" (McCarthy, 1989). The four major components of an interactive multimedia system--i.e., the data system, the software, the hardware, and the communications system--are described, and advantages and disadvantages associated with hypermedia are examined. Examples of hypermedia applications and programs are also given. The digest concludes with a look to the future of hypermedia and the numerous design issues that need to be resolved. (14 references) (MAB)

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by

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Interactive Multimedia Computer Systems

by Eileen E. Schroeder

Definition

The merging of various types of media with the computer has presented the field of education with a hybrid technology called *interactive multimedia*. This technology utilizes new developments in data storage, ever-increasing computer speeds and capabilities, and sophisticated software tools to allow a learner to move through a rich multimedia resource base in a way that fits his/her own learning needs and style.

Interactive multimedia can be defined as "the integration of text, audio, graphics, still image and moving pictures into a single, computer-controlled, multimedia product" (McCarthy, 1989, p. 26). Most current definitions describe a powerful computer connected to a variety of other equipment: videodisc players, compact disc players, scanners, music synthesizers, high resolution monitors, etc. The workstation of the not-too-distant future will have all the multimedia effects—text, audio, graphics, images, sound, motion footage—digitized or converted into a code that the computer can store and manipulate.

Some equate *hypermedia* with *interactive multimedia*, and here the terms will be used synonymously. Hypermedia is the software framework for representing multimedia effects in a non-linear fashion, allowing user annotation, and providing navigational systems. Interactive multimedia refers to the interactive audiovisual aspect of hypermedia systems. The information is stored in *nodes* (concepts) and connected by *links* (associations). Nodes and links are either built into the system or created by the learner as he/she traverses the database. Ambron (1986) sees computer-based multimedia learning stations allowing users to "browse, annotate, link, and elaborate on information in a rich, nonlinear, multimedia data base...explor[ing] and integrat[ing] vast libraries of text, audio, and video information" (p. 7).

Components

Interactive multimedia systems consist of several components: (1) the information or data system; (2) the software for accessing the information; (3) the hardware or technology; and (4) the communications system needed to connect all these parts.

The information or data system (i.e., the contents of the multimedia database) can be any type of text, audio, or visual images. Currently, optical storage methods such as laser videodisc and compact disc are used largely for storage of audio and images (both still and motion), while traditional magnetic storage devices are

used for text, graphics, animation, still images, and audio. With the growing ability to reduce the storage space needed for motion and full color still images, and with the decreasing cost of memory, the trend is toward more storage in optical formats. *Digital Video Interactive* (DVI) is a developing technology that holds promise in this area. By allowing the compression and decompression of digitized images, it will increase the number of images that can be stored on a compact disc and improve the capacity of that medium to store motion video.

The software component consists of generic programs such as Hypercard, ToolBook, Linkway, Quest, Guide, and Notecards. These programs index, provide access to, and allow navigation through the text, visuals, and audio in the multimedia database. This component usually includes video and audio indexing and control software, an index, a map of everything stored, linkages to navigate through the database, and a way to build new links.

The hardware component currently consists of a variety of discrete pieces of equipment which may include a CD-ROM player, a videodisc player, a voice synthesizer, an audio digitizer, a video digitizer, and a digital scanner all connected to a single computer system. The communications system consists of local and non-local networks connecting the hardware and multimedia databases, which may be stored in one place or scattered across locations.

Advantages

Hypermedia provides many advantages to the learner, especially through its abilities to adapt to individual differences and to allow the learner to control the path of his/her study. The learner can either be directed or wander through information. The system can provide customized interfaces for each user with varying levels of guidance. Some studies have shown that a learner-controlled environment can be more effective than a program that adapts automatically to learner differences (Allred & Locatis, 1988).

By providing information in a variety of modalities, providing a context for the information, and allowing multiple paths through this knowledge, the system allows the learner to select information in the format or formats best suited to his/her learning style, ability level, and information needs through one unified system of access. All of this will increase the learner's engagement with the learning situation as he/she elaborates on current knowledge. A hypermedia system can also be used in cooperative learning or group composition with a group of users contributing to a common database of information.

Problems

There are also several problems with hypermedia as it is currently conceived. Hypermedia systems can be both confusing and disorienting, especially for the less able student. One major problem is that current user interfaces are not "friendly" enough for the average user and too inconsistent across systems. Disorientation and distraction can be caused by jumping around throughout the database, the sheer quantity of data, and the lack of information on database size and extent. Some systems may be sacrificing depth of learning for breadth.

Finally, there is still a technological lag between the hardware and software currently available and what is needed for efficient, effective systems. Further development is needed in optical and other storage methods and in equipment interaction.

Examples

Ambron & Hooper (1988, 1990) provide numerous examples of experiments with hypermedia. Most of the projects described in the earlier book are employed in a research context. The later book discusses applications in public schools and higher education. A few of the numerous examples documented elsewhere in the literature include:

Kanji City (Ashworth & Stelovsky, 1989): a program for teaching Japanese through trial and error exploration of a real life environment.

Zarabanda Notebook (Underwood, 1988): a language program based on a Spanish soap opera.

Palenque (Wilson, 1987): a research prototype using DVI that allows learners to explore Mayan ruins in the Yucatan.

Shakespeare Project (Friedlander, 1989): a program used to study various productions of Shakespeare plays.

Intermedia (Yankelovich, 1986): a hypermedia system with tools for text processing, graphics editing, timeline editing, scanned image viewing, and 3D applications that can be used for a variety of subjects.

The Future

Numerous design issues need resolving: (1) what authoring principles and methods work; (2) how misconceptions can be corrected and feedback provided; (3) how assignments can be created; (4) how the needed self-regulation can be developed in learners; (5) how both the materials and learning can be evaluated; (6) how links can be created and managed; (7) how assistance can be provided; and (8) how the learner can be prevented from feeling lost (Marchionini, 1988). Research and development are needed for more powerful searching techniques, better graphic structure searching, and friendlier user interfaces.

This technology is just beginning to develop. Watch for rapid developments as storage mediums which allow a reduction in the required storage space become more fully implemented; as optical storage formats gain wider acceptance; and as software programs for hypermedia become commonly accepted for accessing databases of visual and audio images. As the technology develops

even further, the interactive multimedia computer system will move from a mixture of discrete storage formats utilizing various pieces of equipment to a fully digitized storage format contained on one system.

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